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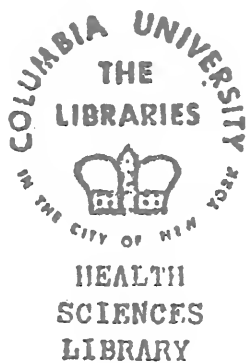


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# Keep Well Leaflet No. 21

## How the Control of the Preventable Diseases is Aided Through Animal Experimentation

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## TO ALL THAT CALL IN TRUTH

"The Truth is nigh unto all them that call upon Him, to all that call upon Him in truth."—Psalms CXLV 18.

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The question of disease prevention, with its correlating prevention of pain, foreshortening of useful life, and the avoiding of precocious death, very often is answered only through careful humane scientific experiments on lower animals.

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Vivisection has its proponents and its opponents.

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We present herewith several articles dealing with this subject in order to place facts before the public and enable them to learn the propriety of such experiments.

## VIVISECTION.\*

By S. DANA HUBBARD, M.D.

*Director Bureau of Public Health Education.*

What is vivisection? A rather broad and general definition of vivisection—as understood and applied by laymen—is the dissection or cutting up of live animals in experimentation.

It is thought, too, by many that this is performed without anaesthetics or only those anaesthetics which paralyze muscular motion and do not prevent pain or suffering.

Further, that such experimentation is done often simply for practice or “showing off,” as it were, interesting phenomena. That the vivisectioners are men blind and deaf to all evidence of pain and suffering. This is untrue and false.

No class of people know better than do Americans what constitutes cruelty to animals and no country has such wise and sane laws on this subject as do the States of this fair land.

*Cruelty to Animals*.—Whoever overdrives, overloads, overworks, torments, deprives of means of sustenance, cruelly beats, mutilates, or cruelly kills, or causes to be so done, inflicts unnecessary cruelty upon animals and should be punished by imprisonment.

Such is the law here and elsewhere.

We, no doubt, all agree that experimentation, especially when accompanied by vivisection, should be undertaken only by properly qualified persons and only by those who have a due appreciation of their responsibilities in this undertaking.

Every regard should be paid for the comfort of the animals employed. The ultimate aim of this work is the *progress of knowledge* and the consequent relief to suffering which is so often the result of ignorance.

The benefits which may accrue from such animal experimentation are felt not only by human beings but (as in veterinary practice) by animals also.

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No attempt will be made by me to defend experiments which have not these distinct aims in view. The ideal experiment is one performed without anæsthesia and without pain. In many cases this ideal can be realized, but in others it is not obtainable.

Pain must be absent (1) on the broad ground of humanity, (2) because it is a far greater disturber of the normal body functions than anaesthetics, and (3) because the struggles of the animal in pain would nullify the accuracy of the experiment, (4) also such resistance would endanger the safety of the delicate apparatus which it is necessary to employ in such work.

Exactly the same argument applies to the study of experimentation of conditions concerning *Aseptic Methods* of Surgery. Here experiments in which the animal is kept alive after an operation to study its effects must be accompanied by the healing process, which is then painless, and if asepsis occurs there is absence of fever and inflammation; these latter would complicate the issue and render void the test.

It is therefore for two reasons that experimenters use both *anaesthetics* and *antiseptics*, (1) to save an animal from suffering pain and (2) to ensure the success of the experiment.

The science of thought is the science of life.

To understand the meaning of vital processes it is necessary to study the living organism, and to obtain this knowledge it is sometimes necessary to perform experiments on living animals.

Some persons regard all experimentation as cruel, detestable and immoral because of unscrupulous misrepresentations put forward by agitating fanatics who do so without apparent reason or purpose. The barbarities recorded by certain anti-vivisectionists do not in reality exist. The repetition of these stories, in spite of repeated contradictions, is, no doubt, incident to wilful misrepresentation and exaggeration oftentimes, but, in some instances it may be due partly to ignorance of the meaning of the technical terms employed by physiological writers or misplaced affection for dumb beasts.

Repeated investigations here and elsewhere have been made, and charges made against experimenters have been carefully sifted, and in no single instance has a charge of cruelty been sustained. All horrifying cases of torture reported, have, in the light of fair analysis and reason been abundantly disproven, and these unfair and untruthful statements have been made only to be later retracted.



There are always two sides to every question. Vivisection is no exception—there are those who favor this form of research and there are those who oppose it.

We will take up the side of the opponents to experimentation. I do not wish to raise bias to influence fair judgment, but I must present my facts as history gives them.

The *Shambles of Science*—the title of an article against experimentation, and which enjoyed but a short life, occasioned a libel suit in which damages of £2,000 Sterling was assessed against this work, the court characterizing it as the "hysterical work" of a fanatic. The Lord Chief Justice advised that such a book should be immediately withdrawn from publication, yet this book has been re-issued with the chapter that formed the subject of the libel entirely omitted. Lovers of idle sensation can still read this work, but on what merit can it ask for consideration?

Now let us look the facts squarely in the face.

What have the Anti-vivisectionists done? What benefit has come from their hands?

Dr. W. W. Keen, an eminent surgeon, is authority for the following:

"The anti-vivisectionists have not a single life saved by their efforts.

"Not a single beneficent discovery has been made by them.

"Not a single disease has been abated or abolished by them, either in animals or in mankind.

"All that they have done is to resist progress, to spend money to conduct campaigns—of abuse and misrepresentation.

"They care apparently little or nothing for the continued suffering and death of human beings or the grief and ensuing poverty of innumerable families.

"They have provided that 26 out of every 1,000 dogs, cats, monkeys, guineapigs, mice and frogs experimented upon shall escape some physical suffering.

"They insist that all experimental research on animals stop and that thousands of human beings and useful animals shall continue, year after year, to suffer and die."

The Age of Experiment is the Age of Progress.

Stop experimentation and you stop progress—medicine is no exception.

Dr. S. Weir Mitchell, an intimate friend of Dr. Keen, when visiting

the anti-vivisectionists' exhibit in Philadelphia, put the matter of the opposition to experimentation in a nutshell when he said:

"Your exhibit is not quite complete—you should place here a dead baby and there a dead guinea-pig, with the motto: "choose between them."

The anti-vivisectionists may be sincere, but it is the opinion of many that they are not fair in their methods of opposition.

Many persons seek light and truth about animal experimentation. The word vivisection is objectionable, for its meaning is usually extended to cover experiments on the effects of the varied and difficult problems connected with nutrition and physiological chemistry, efforts to determine the processes of digestion, the effects of drowning and the value of various methods of resuscitation, of hypodermic injections of various drugs, but none of these involve any "cutting up of a living animal." Only about 6 per cent. of all experiments on animals are strictly vivisections. Every surgical operation is literally a human vivisection—and we take it for granted that these are done humanely and properly and an anæsthetic is used, whether such fact is so stated or not. Then why not in simple justice so infer when reading or being told about animal experimentation?

### The Real and Necessary Object of Vivisection

While animals have benefited enormously from experimental research, the chief object has been to benefit the human race, to diminish suffering, baffle death, and save the breadwinner to the family and the country, or the loved one to relatives.

There are only three ways open to lessen or abolish disease:

1. Try a new remedy or method or operation and try it *first* on man—God forbid—yet there are advocates of human vivisection.
2. Try them first on the lower animals and then on man, provided the trials on animals showed that they would be an improvement upon existing methods. If trials on the lower animals proved that they were ineffective or dangerous then they should not be tried on man at all.
3. Try no experimentation at all either on animal or man, that is to say, "Never make any progress."

Remember that the least deviation from the usual practice, whether in using a new drug or even a larger or smaller dose, or in a different way, is an *experiment*.

Hypodermic injections were unknown until about 50 years ago.

Lumbar puncture—In order to make a diagnosis and later to inject a remedy was unknown until a little over 20 years ago, and has only become routine within the last few years.

"*Clinical observation*" is constantly vaunted by the "Antis" as the proper and best method of progress. I would be the last to decry this method of progress, but the moment you act on your clinical observation by any new method, any new dose, or drug, or any slightly varied or new operation you are making an experiment and on a human being.

*If the departure is so great* from prior procedure, as to involve serious results, then I hold that no one has any right to try such upon a human being first, if it is possible to test it on a lower animal.

In *seven years of experiment* on animals more was done for alleviating human misery from the ravages of syphilis than clinical observation has done in over 4 centuries.

Objection has been made that animals are so differently constructed from man that inferences from results on animals are of no value in the case of man. There are a few such differences—these are known, and even if sometimes marked differences did exist, such for instance as the effect of belladonna or of opium—but as a fact, barring these few exceptional cases, the organs and functions of man and animals correspond exactly in health and disease and the effect of drugs and operations are parallel and in most instances identical.

The "Antis" claim the support of a large number of doctors. Undoubtedly there are some physicians who endorse their views, but who are they? Investigation into these names shows that if the persons to whom they belong are living they are unknown in the profession of medicine. A few of earlier times were men of distinction, but to cite the opinions of men who died years ago against the opinions of similar leaders of today, is like citing opinions of eminent engineers of the last century as to the methods and even the possibilities of constructing a Panama Canal—you know it was for years considered by the most eminent as impossible—but it was done, against the opinions of engineers of today. Facts speak for themselves.

### Syphilis and Vivisection.

Many of the victims of this dreadful disease are innocent.

Many are innocent little children—unborn babies. Some are dead when

born, others destined happily to an early grave, and still others, less fortunate, doomed to drag out a most miserable existence.

Of course, it would be impossible, except as a last desperate resource, to experiment with this disease on human beings.

Metchnikoff—1903, first succeeded in inoculating this disease in apes and later in other animals.

Experiments, heretofore impossible, were immediately begun.

In 1905 Schaudin and Hoffman thus discovered the germ.

In 1910, after a most extraordinary series of experiments with 605 other remedies, Ehrlich discovered Salvarsan, "606," since which time we have had the whip-hand over this plague.

Anti-vivisection if followed to its logical end would not let us fish as a business, for the fish are suffocated by their removal from the water and are thus "tortured," not for their benefit, but for our food.

Would it not also be illogical to poison or trap a rat, even if the plague were at our doors? Or a mouse, if the house is invaded? Or to starve the typhoid-fly in a trap or on "tangle-foot" paper? Or to poison a roach, though its instant death under foot would be allowable?

To judge of the character of argument presented by the "Antis" let us select some of the phrases or epithets used by the writers in favor of not permitting experiments on animals—the mass of terms indicates the vehemence of the opposition.

Scientific hells

Orgy of cruelty

Inhuman devils

Devil's work

Abominable sin

Fiends incarnate

Damnably mean

Infernal work

Diabolical vivisection

Deliberate dabblers in blood

Cruelty of cruelties

Scientific assassination

Black art of vivisection

Imps of hell

Human monsters

Working model of hell

Torture house

Halls of agony

Devils incarnate

Scientific murder

Devilish science

Arch fiend

Master demon

Hellish wrong

Bloody mass of agony

Temples of torment

Lust of cruelty

Torture of the innocent

Satanic

Fiends

Demons

Devilish inventions

Such are some of the many terms applied to vivisection and research institutions by these advocates.

### **What Vivisection Has Done for Human Beings and Animals**

The achievements of research:

1. Antiseptic method of surgery made possible.
2. The many wonders of modern surgery are largely the results of animal experimentation.
3. Surgery of the internal organs—stomach, spleen, liver, appendix, intestines, gall stones, kidneys, and female organs is possible through the study of infection by experimentation on animals.
4. Modern and wonderful surgery of the brain made possible through experimentation.
5. The new surgery of the chest, including the heart, the lungs and large vessels made practical through experimentation on animals.
6. Tetanus (lockjaw) has been almost entirely abolished. Prevention is possible only through such experimentation on the lower animals. This formerly often occurred after operations and after accidents, especially pistol shot wounds and fireworks.
7. Reduced the death rate in open fractures (compound) from 66 in a hundred fatalities to less than one in a hundred.
8. Reduced the death rate in major female operations from 66 in a hundred to from 2 to 3 in a hundred.
9. Made the death rate in operations for rupture, amputation, and removal of tumors a negligible factor.
10. Abolished yellow fever—a wonderful triumph—and through its sanitary effect on engineering problems, made possible the Panama Canal. In this instance human volunteers had to be used and one, Dr. Lazaar, sacrificed his life.
11. Diminished materially the ravages of malaria.
12. Reduced the incidence of rabies (hydrophobia).
13. Devised a method of direct transfusion of blood, which has saved many precious lives.
14. Cut the death rate of diphtheria. All over the world—in 19 European and American cities the death rate has been made to fall from 79.9 per 100,000 population before antitoxin to 19 per 100,000 (1894 before—1905 after). The rate is less than  $\frac{1}{4}$  its former rate.

15. Reduced the mortality of epidemic cerebro-spinal meningitis from 65% to under 25%.

16. Largely abolished post-operative hospital sepsis and gangrene, the foes of surgical undertaking. Formerly no matter how brilliant the operation or the operator, these fatal hospital diseases, sepsis and gangrene, were apt to appear and destroy the patient.

17. Made operation for goitre possible.

18. Aided in reducing the death rate of tuberculosis. Koch's discovery of the germ of consumption is the "*corner stone*" of all of our modern sanitary achievements.

19. Through animal experimentation the British Army abolished Malta fever. Before research this destroyed in 1905, 1,300 men of the garrison; in 1909, after research, there was only one death.

20. Almost abolished puerperal (childbed) fever. Statistics before discovery, 5 to 57 deaths of mothers per 1,000, while today after such discovery the rate is 1 in 1,250 births.

21. Discovered Salvarsan, "606," which bids fair to protect many innocent wives and unborn children.

22. Typhoid vaccine largely abolished typhoid from armies of the world wherever used.

23. Through animal experimentation we are gradually lessening the ravages of cancer and we hope we are approaching the discovery of the cause of cancer, poliomyelitis, and other children's diseases; then we hope the cure will quickly follow.

25. Sleeping sickness—methods of transmission, pathology, and treatment.

26. Animal experimentation has enormously benefited animals by discovery of the causes, and in many cases the means of preventing, and in some a positive cure. Conspicuous among these are tuberculosis, rinderpest, anthrax, glanders, hog cholera, chicken cholera, lumpy jaw, and other diseases, some of which also attack mankind.

Surely this list is sufficient reason to forward for experimentation and any intelligent person would be sufficiently influenced by the same. When science has progressed through this aid, who is the fellow who would dare stay the hands of men who are trying to lift the curse of disease from the whole race, not only of mankind, but of animals also? I say, if there be such creatures, let such cruel ones, enemies of our children, of our sick, in fact enemies of humanity, let them stand up and be counted by all.

There is still much work to be done—in fact, we have just crossed the threshold of preventing and curing of the infectious diseases.

The work on malarial fever is advancing rapidly through mosquito study, and if we continue to progress as fast as we have in the past ten years, this dread disease will be annihilated.

The pain inflicted in all the laboratories of the world put together during an entire year is less than that which is every day inflicted in the slaughter of animals for food, and this, too, under the most modern cruelty of animal supervision; also, to that which farm laborers inflict in spaying animals by thousands in order that beef, chicken and mutton may be more tender or have a more pleasant flavor; to that inflicted by the hunter when the victims of his sport are imperfectly shot, die a lingering death, or, wounded, are unable to water and feed themselves and so suffer interminably; to that which women allow in order to have fine feathers (ospreys) in their hats and furs upon their backs.

So far as the satisfaction of appetite, the pandering to the so-called sportsman's instincts, or the gratification of vanity are concerned, those things known to be useless and cruel, may go on uncriticised or unchecked. The "Antis" disregard these facts or to date have made no effort to prevent them, so far as we can determine. The only pain which seems to stir the feelings of the "Antis," meeting their disapprobation and enabling them to indulge in their familiar epithets, is one of the most justifiable bits of pain in the whole world—a pain inflicted with the noblest of all objects and by humane men, for so admittedly must the medical profession be considered—that object being to prevent future pain, which otherwise would encompass the whole of life.

The "Antis" do not come in contact with disease and suffering all day and every day as medical men do; therefore it is impossible for them to realize how widespread sickness really is and what terrible form it takes in many instances. Their ideas are vague; they talk about physical suffering without any intimate knowledge of this question.

These bestow their sympathies along upon the moderate number of animals subjected to the vivisector's knife or syringe—guinea pigs, dogs, rabbits, mice, monkeys, etc.

They have no sympathies for the large number of victims of preventable disease, which would have suffered far more intensely if the few had not been sacrificed. Can it be wondered at that medical men, whose experience is so different from theirs, should feel otherwise? The busy doc-

tor's life is not one in which there are just a few painful partings with dear ones, but he has many daily experiences, his life is literally steeped in pitiful and sad incidents, from early morn till late into the night. His sympathies aim at the relief and cure of all this evil, and the death of a few guinea pigs or rabbits is a necessary incident which he has the courage to permit because of the greater good that is the ultimate result.

*Diphtheria.*—The change in our opinions regarding this disease, incident entirely to animal experimentation, is incontestable. This disease no longer inspires the terror it used to do, for it is one that can be definitely ascertained, and if early detected, can be quickly, certainly and easily cured by the method of serum therapy.

*Typhoid Fever.*—It was not until the germ of typhoid fever was isolated and generally recognized; not until its growth and means of its destruction, not until its methods of transmission were fully understood, that this very serious malady was controlled. To-day it is a rarity in many of our largest cities. Medical schools are complaining that students through a whole four-year course fail to see a case in order to study it clinically.

### *Immunity to Disease—*

Bacteriology is at the bottom of hygiene and sanitation.

It is by observing hygienic precautions that certain communicable diseases are prevented.

The basis of bacteriology so far as it relates to the production of and recovery from disease is animal experimentation.

Filth or dirt has been defined as matter out of place. Blood on a carpet is certainly dirt, and it ought not to be there, but blood in the arteries or veins is in its right place and it does the duty of nutrition. One of these duties is to exert a protective influence upon the whole body. We are exposed, all of us, so long as spitting in public places is not prevented, to the germs of many communicable diseases, particularly consumption and influenza, but we do not all die of these diseases. This is mainly because the scavengers of our system—the white blood corpuscles—are in good trim and are able successfully to devour the bacteria that enter our interior.

It is only those persons who are "run down" and in whom the white corpuscles are below par that contract disease. In assisting the white corpuscles to perform the duty of destroying dangerous organisms enter-



ing our bodies, the co-operation of certain substances dissolved in the fluid portion of the blood is also essential.

Some time ago—quite recently—there were discovered auxiliary substances, we called them “Opsonins,” from a Greek word which means “to prepare the feast.” The opsonin either adds something to the bacterium which makes it tasty to the white blood corpuscles (or neutralizes) or modifies something which previously made it distasteful. The white blood corpuscles will not ingest and devour most bacteria from an ordinary culture fluid, but they do so eagerly and immediately the bacteria are bathed in serum, and the serum which is most efficacious in acting as a sort of sauce is that which has been obtained from an animal which has been previously infected with the same kind of bacteria, and which has recovered from the ailment such bacteria have set up. This is not mere fancy or theory. It is well known that the yeast plant (yeast, by the way, is very similar in many details to bacteria) may be grown in a solution of sugar and that the sugar is broken up and disappears and two new substances formed from the sugar take its place. One of these is the poison alcohol.

If bacteria grow in the blood they produce poisons in a way analogous to that by which yeast produces alcohol. These poisons are called *toxins*.

There are substances in the blood which are called antitoxins, because they neutralize the toxin produced by the bacteria. The presence of antitoxin (diphtheria) is a means of natural defense against the harmful effects of the toxins which they would otherwise produce. This may be determined by a test devised by a scientist and is called after his name, “The Schick Test.”

The marvelous part of nature's defense is that unless we are overwhelmed quickly, antitoxin in our blood increases in proportion to the amount of toxin. How can we explain this? The following is a practical method of so doing. It is a familiar fact that manual labor increases the hardness of the palms of the hands—the friction stimulates the outer cells into increased activity, so that the top layer of the skin grows in thickness. The body affords numerous instances of how it is capable of “rising to the occasion” and increasing its defenses when called upon similarly. Just in this same manner the presence of a toxin in the blood stimulates living cells to produce more and more antitoxin. Another peculiar fact is also demonstrable—the blood remains rich in antitoxin for a considerable time afterwards, thus showing how it is that one who has had

an infectious disease does not readily take it a second time. He is *immune*, we say, and will continue to resist reinfection for a certain number of years, because his blood is so rich in the antidote. By infecting the horse we can obtain these anti-bodies in great concentration and transfer them to human beings of all ages, and so prevent and cure several diseases.

The principle of serum treatment depends upon these ascertained and definitely proven facts, the direct result of animal experimentation.

Now something about consumption. How may we cure this dread disease? We know the cause, but we have not as yet discovered a remedy. Scientists everywhere are working on this and they should be aided and not hindered. In the treatment of tuberculosis the doctor tries to increase nature's method of cure: good, easily digested food, pure air, at all times. These do much to increase the healthfulness of the blood stream and fortify its natural power of destroying germs. Many times this alone suffices, but at other times it is wholly insufficient, particularly if the disease has advanced and the number of bacteria is too great for the enfeebled white blood corpuscles to battle successfully against.

If it existed the doctor would administer some opsonin by injecting it under the skin, in order to increase the resistance of the patient. But in this disease (tuberculosis) we do not know the opsonin—it is up to us to find it.

The making of anti-bodies in animals for use in man or animals for the prevention and cure of disease:

Let us choose for description diphtheria antitoxin:

A pure culture of virulent diphtheria germs is grown in broth and the toxins formed are filtered off and a certain amount is injected into a horse. A slight swelling appears locally. When the animal has recovered, a second larger injection is given. This blood is collected. This is repeated several times, for it is rich in diphtheria antitoxin, the natural antidote that has enabled the horse to withstand at the end of the series of injections a dose of toxin, which if given earlier would have killed it. The horse's blood is allowed to clot, and the liquid residue (serum) contains the antidote. This is purified and concentrated and is the diphtheria antitoxin used so successfully in the treatment of diphtheria in human beings. But it must be given early and in sufficient dosage. The Department of Health gives a schedule of dosage according to age of patient and character of disease.

What more natural way is possible of treating a disease? It has been used in this city since 1895, and has reduced the death rate from diphtheria from about 40 per cent. to 8 per cent.

The pathologists at first were timid about using horse serum in human beings, even if it carried the life-saving antitoxin or opsonin, but Professor Richét argued that if this serum protected a horse injected with many times a fatal dose of diphtheria toxin, it should do so in the case of a human being, and he tried it and it was successful.

The diphtheria poison is very deadly in the human being; therefore to be effective, it must be used early in order to antidote the toxin. To-day the treatment of diphtheria is mainly by using diphtheria antitoxin. Not to employ it indicates that the doctor is uninformed and is jeopardizing the precious life of his patient and to continue not to use such an antidote is little short of criminal.

Diphtheria has not been stamped out because the efforts of prevention are not adequate and those that are known to science are not uniformly and generally applied.

Prevention, it is true, is better than cure, but cure is better than suffering and death. To-day the medical profession can positively cure diphtheria, and by use of a vaccine can prevent it, and if medical progress continues its stride as it is doing, who can doubt but that in the very near future diseases like yellow fever, typhus, typhoid and smallpox will not only be rare, but will be stamped out?

Why, may we ask, has typhus and typhoid fever died out in our large American cities? In our opinion it is incident directly to the learning of their nature, improving sanitation and destroying the vermin that transmit typhus and the bacilli which cause typhoid fever. How did we learn these facts? Of course, largely through animal experimentation.

Many citizens quite often complain of the extravagances of public officials and of the indifference in quarters affecting health. Why is this? But, you will say, how does this come in here? The public authorities are not vivisectors. No; it is true that in many instances they are not, but the action of all public health officials is directly due to the desires of public opinion—healthy public opinion which has been preached to deaf ears for many years, has at last impressed itself upon many minds, and this knowledge was the offspring of pathological experiment. It was not until the germ of typhoid was isolated and recognized that prevention and control through such means as the pasteurization of milk and the purifica-

tion of water became certainly possible, yet these alone were not wholly effective under conditions such as exist in warfare until the immunizing vaccine was produced, tested on animals and man and then successfully used in our armies. Now having such a lesson before us, must not the people obey the teachings of science?

Let us pursue this vivisection still further.

A ship enters our port. It is infected with *plague* and the ship is also infested with rats—carriers of plague.

Would it be preferable to kill the rats and so prevent them and the disease—a terrible pestilence—entering our port? A plague visitation would cause untold disaster. Or would staying one's hand, because the slaughter of the rats would be a painful proceeding, be the more preferable?

The captain who spared the rats would be guilty of a criminal act which would cause the unnecessary death of many innocent human beings, and I might state that it is so with many anti-vivisectionists, who by their acts are similarly causing the deaths of many innocent human beings, as well as animals.

The anti-vivisectionist sees only the pain inflicted and does not heed the pain prevented.

#### *Conclusions.*

Unnecessary and needless vivisection should be stopped.

Vivisection by inexperienced, unsophisticated, and improper individuals should be stopped.

All vivisection should be accompanied by every possible precaution to prevent suffering of all kinds.

No one should needlessly restrict scientific bodies in pursuit of knowledge to aid the sick or suffering.

That experiments upon living animals have proved of the utmost service to mankind in the past and are indispensable to the future progress of medicine and public health.

While strongly depreciating the infliction of unnecessary pain, it is our opinion—alike in the interest of man and of animals—that it is not desirable to restrict competent persons in the performance of animal experimentation.

We regret the widespread lack of information regarding the aims and achievements and the procedures of animal experimentation, and we deplore the persistent misrepresentation of these aims, purposes and achievements.

We protest against the frequent denunciation of self-sacrificing, high-minded men of science who are devoting their lives to the welfare of mankind in efforts to solve the complicated problems of living beings and their diseases.

It is our opinion that unrestricted performance by proper persons of scientific experiments upon living animals is essential to the maintenance and progress of medicine and its allied science, biology.

There is not, so far as I can learn, a single resolution of any scientific body expressing a contrary opinion.

## VIVISECTION

### A Merciful Servant of Man and of the Animals Over Which He Has Dominion

By W. W. KEEN, M. D.

*Emeritus Professor of Surgery, Jefferson Medical College, Philadelphia.*

Reprinted from *The Country Gentleman*, February 12, 1921, by gracious permission of the author and the editor.

EDITORIAL NOTE.—Dr. W. W. Keen wrote this article shortly before the eighty-fourth anniversary of his birth. At the subsequent birthday dinner, given in his honor by leading physicians and surgeons and other distinguished citizens of the United States, he was noticeably one of the most active men present. Doctor Keen is recognized as one of the greatest surgeons America has produced. His prominence and distinguished service to humanity are evidenced by the many degrees which he has received from colleges, universities and scientific societies of Europe and America.

Vivisection means literally "cutting a living being." Every surgical operation is literally a vivisection. In common speech, however, the word has obtained a much wider meaning—namely, any mode of experimenting on an animal, by administering a drug by the mouth, by a hypodermic

syringe or by other means; by varying the quality or the quantity of food; and also any cutting operation for the purpose of research. The proper term is "experimental research."

The three principal objections to experimental research are: That it is cruel; that only 25 per cent. of the profession approve of it; and that it has been of no benefit either to man or to animals. I will consider them in the order given.

That cruel suffering was inflicted in the past is an undoubted fact, but we must never forget that prior to October 16, 1846, anæsthesia was impossible, for no effective anæsthetic was known. Even the word anæsthesia and its derivatives did not exist. I condemn the utter indifference to pain such as was admitted by Klein before the first English commission in 1875; whether he is now alive or not I do not know. Dr. B. A. Watson, of Jersey City, was cruel in his experiments on shock, and was soundly rebuked at the time. Mantegazza, in his book on the Physiology of Pain, is the only experimenter of whom I have any knowledge who deliberately did perform cruel experiments for the very purpose of studying the effects of pain *per se*.

But, while the experiments mentioned above are constantly described by the A-V's, one important fact is nearly always omitted—the dates of these events. The reader, uninformed in the history of medicine, is apt to believe that these men are now living and performing such experiments.

### The Apostle of Gentleness

Doctor Watson died in 1892. His experiments were done thirty years ago, in 1890. Mantegazza's book was published in 1880, forty years ago. The "ferociously cruel Magendie" was born in 1783, six years before the Constitution of the United States was adopted, and his last paper was published in 1842, four years before the introduction of anæsthesia in 1846. Dupuytren was born in 1777 and died in 1835, eleven years before anæsthesia was known.

To compare the work of men who never knew there was such a thing as an anæsthetic with those of to-day is like comparing the antiquated methods of the engineers of seventy-five and one hundred years ago with the methods of General Goethals and his associates in Panama.

The A-V's—I adopt A-V as a clearly understood contraction of anti-vivisection and its derivatives—insist that vivisection is cutting up and

torturing live animals with the alleged idea of gaining from their torments certain biological and pathological facts designed to be useful in the treatment of human maladies. All this is precisely what modern research by experiment on animals is not. Torturing animals and studying their torments are not the occupation of research workers. Such suffering, especially severe suffering, would defeat the very objects of such researches. "To rend them to shreds" could by no possibility give the least information on any problem of health or disease.

Had the A-V's followed Owen Wister's suggestion and said, "The Declaration of Independence was signed by Christopher Columbus on Washington's birthday during the siege of Vicksburg in the presence of Queen Elizabeth and Judas Iscariot," their statement would have been equally veracious and more striking.

Moreover, the A-V's studiously avoid any mention of anæsthesia in connection with the many cases which they quote. For instance, take an experiment of Crile, of Cleveland. Crile is said to have poured boiling water into the intestines of a dog while he was alive. If this description were literally true Crile should have been prosecuted and would have been convicted by his own testimony. Yet no prosecution was ever instituted by those who express such horror.

But what are the real facts? For certain reasons, later proved to be valid for both animal and man, Crile suspected that operative roughness, or any procedure which involved serious injury and which were the animal conscious would be extremely painful but which when the animal was rendered unconscious to pain could not cause the least pain, was nevertheless injurious to the animal and would endanger its recovery after any operation. He suspected that the tearing out of a cancerous breast—as I was taught to do by Joseph Pancoast, the best surgeon of his age, sixty years ago—so as to lessen hemorrhage, seriously injured the patient and might easily turn the scale against recovery, although, being anæsthetized, the patient was not conscious of the least pain.

Accordingly, Crile tested his idea upon dogs. He did pour boiling water into the belly—not into the intestines—he did crush the paws with stout pincers and did burn the paws in a gas flame, and so forth, and in his book—*Surgical Shock*, p. 14—he especially states that "in all cases the animals were anæsthetized," a statement the A-V's almost always suppress.

What has been the result of his researches? Crile has become the

Apostle of Gentleness to all the surgical world. By heeding his warnings many a life was saved in the Great War, through watching the blood pressure, especially in shock, when even a slight additional injury, by operating roughly, might turn the scale.

### Anaesthetics Are Essential

Now is it fair to suppress all mention of an anæsthetic in such apparently cruel experiments, especially when the author expressly stated that an anæsthetic had been given in every case?

It may be that the operator is a physiologist seeking to unravel the complex processes of the nervous system or a surgeon testing a new operation. On a struggling animal no delicate surgical operation can possibly be done, and no exact observation can be made. An anæsthetic, therefore, is an absolute necessity, apart from any humane motive.

It has been asserted that the lips of animals are sewed or clamped together to prevent their screams from disturbing the operator's nerves. Never, till now, in all my long life have I heard such an allegation. I do not believe it is true. Besides that, try the experiment on yourself. Hold your lips together and find out whether you can still scream. I can.

"Under incomplete anæsthesia" is a phrase often quoted against Crile. Let me give an instance from my own experience. A young lady was threatened with a permanently stiff elbow. To prevent this serious disability I had a dentist give her nitrous oxid several times. As soon as she was unconscious I forcibly flexed and extended the joint. Anyone ignorant of surgery and looking on would have exclaimed, "What a brute that surgeon is!" For she writhed and struggled so that three of us had difficulty in preventing her from landing on the floor. Yet when she recovered she knew nothing of her struggles and had not felt the slightest pain. That was "incomplete anæsthesia."

Again, the surgeon has every possible selfish motive to facilitate in every way the speedy recovery of the animal by the greatest kindness and care. If the mortality of his new operation is large his hopes are blasted and his reputation suffers.

The head nurse of one of America's best surgical clinics was called to the Rockefeller Institute to care for the animals.

Claude Bernard's experiments on the effects of heat on dogs are made much of in A-V literature. "Some" are said to have been baked to death and "some" merely boiled at temperatures of between 200 and



300 degrees Fahrenheit. Again, what are the real facts? First, these experiments were done forty-four years ago, in 1876, to determine the effects of heat alone on healthy animals—that is, with none of the profound disturbances caused by disease in man. Second, there were just three dogs. The naming of 300 degrees is unwarrantable, for the highest temperature in Bernard's three experiments was just 100 degrees Centigrade, or 212 degrees of our absurd Fahrenheit scale. The dogs died when their own body temperature reached about 112 degrees Fahrenheit, only a few degrees higher than a not uncommon temperature in high fever in our patients.

In industry we have men exposed to very high temperatures. In 1892—*Medical News*, LXI, p. 262—Coplin published the results of exposure of 500 and 800 men, the day and night shifts, in a sugar refinery at temperatures from 95 degrees Fahrenheit to 165 degrees Fahrenheit in a hot July. Of this large number, 213 had to stop work on account of heat exhaustion. In consequence of his wise and vigorous treatment, aimed especially at reducing their body temperatures, 185 were able to return to work and only one died.

I do not hesitate to condemn Bernard's omission of opium or other narcotic in his experiments; but his experiences should be correctly quoted.

I can also contribute a bit of personal experience just here. I have had quite a lot of accidents—"annual accidents," my friends insist on calling them. I have broken my nose and both collar bones, have dislocated one shoulder and broken the other. Also, in addition to other minor operations, I have had a portion of my large bowel cut out. I might almost pose as a museum specimen.

When my dislocated shoulder threatened to become stiff I was "baked alive"—that is, my shoulder and a considerable adjacent area on my arm, chest and back were so baked—up to 250 degrees Fahrenheit without discomfort, and with the result that my arm is as useful as ever.

When the piece of my large bowel was cut out and the two open ends sewed together—I was nearly seventy-five years old at that time—I was reclining in bed with a letter pad on my knee three days after the operation, was out of bed in ten days, and here I am, nine years later, in good health.

Before the perfection of the antiseptic method by Lister and others, and before the very many experiments needed to determine just the best

and safest way to do such an operation, no prudent surgeon would have dared to attempt it. I should have been allowed to die. The very many meticulous details required to sew the two open ends of the bowel together, so exactly as to prevent any possible leakage—for the least leakage meant a fatal peritonitis—had been worked out by experiments on animals, and my friends and I thank God that they had been so determined.

If we are to improve our treatment in any department of medicine, only two courses are open to us: First, to try a new drug or a new method first on animals and, if the results justify it, then use the better treatment on man; second, try it first on man.

Personally, I advocate the first. Mrs. Caroline Earle White, long the leader and still the idol of the A-V's, in 1886 published an answer to one of my addresses. On page 4 she said: "I take issue with Doctor Keen \* \* \* where he says 'These experiments cannot be, nay, they must not be, tested first upon man.' I assert, on the contrary, that in the majority of cases they must be tested first upon man or not tested at all."

On page 10 she said: "Doctor Keen next mentions that 'in India alone 20,000 human beings die annually from snake bites and that as yet no antidote has been discovered. \* \* \* How can we seek intelligently for an antidote,' he asks, 'until we know accurately the effects of the poison?' The answer that suggests itself to me is very different from the one which she makes. \* \* \* Here is an opportunity which is not often afforded of *experimenting upon human beings*. Since they would infallibly die from the snake bites, there can be no objection to trying upon them every antidote that can be discovered." The proposal is as absurd as it is cruel.

Thirty-five years have passed since Mrs. White thus urged "human vivisection." I have yet to see the first repudiation of it by any A-V!

In 1909 a set of rules regarding animals was drawn up. They are given in full in my book on Animal Experimentation and Medical Progress, p. 246. I know of no laboratory in the United States in which these rules are not posted up; and, what is more, they are lived up to.

### An Astonishing Conclusion

These rules provide for the scrupulous care of the animals. No operations whatever are permitted except with the sanction of the director, usually a responsible member of the faculty. In case the operation would cause greater discomfort than that attending anæsthesia, the animal must

first be "rendered incapable of perceiving pain." Exceptions are allowed only by express sanction of the director. Such exceptions are excessively rare. "At the conclusion of the experiment the animal shall be painlessly killed."

2. With regard to the attitude of the medical profession, in an extraordinary pamphlet called "Medical Opinions Against Vivisection," issued without any date by the New York A-V Society, on page 2 it is stated that only 25 per cent. of the medical fraternity are in favor of experimental research. We are not informed how this astonishing conclusion has been reached by the authors of the pamphlet.

The only real way to obtain any correct idea of the general sentiments of the profession is by knowing what the profession itself has said in the great international congresses of medicine and surgery in Europe and America, with their thousands of members; in the national associations—for example, the American Medical Association, comprising over 84,000 members; in the American Association for the Advancement of Science, having also thousands of members; and in special societies with hundreds of members.

These organizations have passed resolutions indorsing experimental research again and again—on pages xv-xviii of my book on Animal Experimentation, and so forth, I give several of these resolutions in full. How were these expressions of opinion possibly passed and, as is frequently recorded, *unanimously*, if three-quarters of the profession are neutral or hostile? Why did not these three-quarters protest?

On the other hand, I do not know of a single organization, medical or scientific, which has passed any resolution against such research.

The last British Commission on Vivisection, 1906-07, of which, observe, opponents as well as advocates of research were members, unanimously passed the following resolution—Final Report, p. 20:

"We desire further to state that the harrowing descriptions and illustrations of operations inflicted on animals, which are freely circulated by post, advertisement or otherwise, are in many cases calculated to mislead the public, so far as they suggest that the animals in question were not under an anæsthetic. To represent that animals subjected to experiments in this country are wantonly tortured would, in our opinion, be absolutely false."

The same is true of the United States to-day.

So much for quantity. Now let us look at the quality of the men on the two sides.

The pamphlet just alluded to contains several hundred names. It has influenced many persons. In a letter to one of my friends, Mrs. Belais, president of the New York A-V Society, says: "Errors occur *very infrequently*"—her italics—"but we are always most punctilious about correction." How "accurate" the pamphlet is the following will show:

### Some Outstanding Achievements

Dr. William H. Welch, of Johns Hopkins, our champion advocate of experimental research, appears in the list of its opponents! Doctor Woglum, of the Crocker Cancer Commission, is classed as another opponent! Sir David Ferrier, my old Scotch friend and a world-famous experimenter on the brain, who has lived in London for over forty years, as I know personally, is listed in Paris, France, and among the opponents!

How "punctilious" they are about such corrections is evident by this instance:

In the London Times of April 18, 1902, Sir Frederick Treves protested against the misuse of his name as an opponent of research. In 1920, eighteen years after this and later repeated protests, his name is still so misquoted in this very pamphlet.

*Of living, really eminent medical men, I cannot count a score who are opposed to experimental research.*

3. Let us now consider a few of the benefits of experimental research.

The A-V's declare that bacteriology, one of the greatest discoveries ever made in medicine, is not a science at all. They claim that germs are not the cause of typhoid, tetanus, diphtheria, tuberculosis, and so forth; that all the wonderfully effective vaccines and serums against these various diseases are pouring filth into the blood and are of no use anyhow. In their suit against the Red Cross they alleged that "nothing has been discovered by means of it (vivisection) that is at all beneficial to the human race," and in a letter, dated July 29, 1920, sent to every member of the 1921 Pennsylvania legislature, they state, "The results of this cruelty are of no value to the human race."

They care nothing whatever for the benefits which have followed from the researches of Pasteur and Lister.

I can give only a few examples of many perfectly attested benefits. I shall consider each very briefly: Typhoid fever, puerperal (childbed) fever, diphtheria, tetanus, syphilis, yellow fever, The Surgery of War, The Surgery of Peace and The Cry of the Animals.

**TYPHOID FEVER.** In the Civil War 10 per cent. of all deaths were from typhoid.

In the Spanish-American War every fifth soldier in our army fell ill of typhoid, and 86 per cent. of all deaths were from typhoid.

In the recent Great War almost none! Why? Because in the interval between 1898 and 1914 vaccination against typhoid had been discovered and developed.

Let me illustrate by two great experiments on 8,000 and on about 750,000 human beings respectively:

Plymouth, Pennsylvania, a town of 8,000 people, was supplied with water from a reservoir fed by a mountain stream. In the first three months of 1885 one man, living on the banks of this stream, was ill with typhoid fever. His copious dejecta were thrown out upon the snow without disinfection. When a warm thaw with rain occurred toward the end of March, the germs of typhoid from the dejecta were washed into the stream. On April tenth an epidemic of typhoid broke out in the town and caused, in all, 1104 cases and 114 deaths.

From September 21, 1917, to January 25, 1918, the figures are official—a period about two weeks longer than the war with Spain, there were, on the average, 742,626 men every day in the camps in the United States. They came from unprotected communities, where autumnal typhoid was rife. Yet during these four months there were but 114 cases of typhoid and five of paratyphoid fever, a fever closely resembling typhoid. Had the conditions of 1898 prevailed, there would have been 144,506 cases and about 15,000 deaths.

Why was typhoid almost banished? Because every soldier was immediately vaccinated against the fever. As soon as this vaccination was completed, in less than five weeks from December 14, 1917, to January 15, 1918, there were only six cases in the three-quarters of a million men. These magnificent results were a direct outcome of laboratory work.

During the Great War the British A-V's did their best to dissuade the soldiers from being vaccinated. Had the soldiers heeded them, thousands of lives would have been needlessly sacrificed.

**CHILDBED, OR PUERPERAL FEVER.** In my student days—1860-62—child-bearing caused the death of three to five mothers in every hundred. Was not this a horrible result of a normal and necessary human function?

But sometimes this mortality rose to 20 per cent and, in local epidemics, even fifty-five mothers out of every one hundred died!

What are the present figures? You will find them in detail in A. W. W. Lea's *Puerperal Infection*, London, 1910, p. 24. Cases already infected entering the maternity ward, of course, are excluded. Lea quotes various wonderful statistics, culminating in one series of 8,373 successive births without the death of even one mother from infection.

### Pasteur's Discovery

Why this enormous saving of human lives? Because in 1843 Oliver Wendell Holmes showed that, in some then unknown way, the doctor and the nurse carried the fever from patient to patient; and finally, thirty-six years later, 1879, Pasteur, in a debate in the Academy of Medicine in Paris, when a doubt was expressed as to whether the germ, asserted to be the cause of this dreadful mortality, would ever be seen, leaped to the blackboard, drew what we now know as the *Streptococcus*, one of the deadliest germs, and cried out, "Look! This is the germ of puerperal fever!" And this germ, which formerly left death and woe in its path, is now under our heel.

When your own wives and daughters face the pangs and perils of maternity to whom will you turn for help—to those who have practically abolished childbed fever or to those who would have prevented this blessed victory?

It is claimed by the A-V's that all this is due to sanitation and to cleanliness. But what are sanitation and cleanliness? They are based wholly on laboratory researches into what the *Streptococcus* is, what it does, how it is spread and how it may be abolished. In other words, this saving of lives is due to bacteriology, a science which the A-V's totally reject.

DIPHTHERIA. Up to 1895 every active surgeon, myself among the number, was often called upon to do a tracheotomy—that is, to open the windpipe, or trachea, in the neck to prevent the death of a child by suffocation from diphtheria.

I have not the time to paint the picture in detail of the agonized mother begging for the life of her child, yet dreading the operation. And no wonder! The surgeons dreaded it almost as much, for death, alas, too often followed in spite of his efforts.

In 1895 the antitoxin against diphtheria was introduced and soon became a common treatment. Exactly as the use of antitoxin increased in frequency the calls on the surgeon for tracheotomy decreased.

After a few years I was never called on to do this operation, and my experience is duplicated, I may safely say, by practically every surgeon.

The mortality of diphtheria increases with every day that the use of the antitoxin is delayed. When given on the very first day, in 218 cases of a series of nearly 4,000, the mortality was zero—not one death. If delayed till the second day, the mortality was 5 per cent. If delayed till the third day, it rose to 12 per cent. If delayed till the fourth day, it rose to 16 per cent.

**TETANUS OR LOCKJAW.** I wish I had space to describe this horrible disease as I saw it in the Civil War, when it killed nine out of every ten men attacked by it. Imagine the muscles all over the body to be gripped by cramps, so severe that the whole body is sometimes bent backward, only the heels and the head touching the bed! Unfortunately, the patient's mind is as clear as my reader's at this moment. Finally a mercifully cruel spasm of the muscles of the throat chokes the patient to death.

The germ of tetanus was discovered in 1884. Its home is in the intestines of animals, especially of the horse.

### **The Germ of Tetanus**

The soil of Belgium and Northern France has been cultivated and roamed over by horses and other animals for 2,000 years, as every school-boy knows from Cæsar's Gallic War. It is the most dangerous spot of ground, I suppose, on earth, for it is full of the most virulent germs of tetanus and other infections.

In the Great War the infection of practically every wound and its extreme intensity had never before been met with. Hence, very soon it became the rule to give every wounded soldier a full dose of the antitetanic serum at the very first opportunity. Tetanus at once became less and less frequent, so that later one case in Paris was shown to Dr. Harvey Cushing, of Harvard, as a curiosity.

**SYPHILIS.** This scourge has ravaged the world since the sixteenth century. In this long time we have been able to ameliorate the disease but practically never to cure it.

Why? Because we did not know the cause. Until this was found we were fighting in the dark. Now mark what the advent of the experimental method meant.

Metchnikoff, in 1903, first succeeded in inoculating the disease in apes

and later in other animals. Experiments on animals, impossible before that time, were immediately begun. In 1905 Schaudinn and Hoffmann thus discovered the germ. In 1910, after a most extraordinary series of experiments with six hundred and five other remedies, which had to be discarded as ineffective or too dangerous, Ehrlich discovered his Salvarsan, or 606, since which time we have had the whip hand over this desolating plague. Many of the victims of this dreadful disease are innocent women; many others are innocent children, some already dead when born and others destined happily to an early grave; still others, less fortunate, doomed to drag out a miserable existence. Not a few of the victims were innocent doctors, accidentally infected, of whom I have known five; one committed suicide.

*In seven years experiments on animals did more for alleviating human misery from this one disease than clinical observation on man alone had done in over four centuries.*

**YELLOW FEVER.** We were more fortunate in the fight against yellow fever, for by the research work of Reed, Lazear and others was discovered the means by which the disease was carried, and, by attacking the mosquito, a wonderful victory was won.

But lately Noguchi, that genius of the Rockefeller Institute, has finally discovered the actual germ of the disease. This discovery enabled him to prepare a preventive serum. To-day, December tenth, as I am writing these words, the newspapers announce that the serum of Noguchi has been tried where the fever exists and has been found to confer immunity upon those who have never had the fever.

Very soon the dream of Surgeon-General Gorgas will be realized, that yellow fever has been banished from the world.

**SURGERY OF WAR.** I have mentioned the intensity of the infection seen in the Great War. At first our ordinary disinfectants failed utterly.

Two classes of wounds were recognized—the contaminated and the infected.

A contaminated wound was one in which the tissues involved had had a moderate number of bacteria strewn on the surfaces of the wound. The missiles of the war far exceeded those of any other war in their enormous velocity. When a fragment of shell struck a leg, it contaminated all the surfaces of the wound, but also, by the impact of the blow, killed or devitalized a certain thickness of tissue next the surface of the wound. This dead and dying tissue is the very best food for the



various bacteria. In from six to, say, twelve hours, or sometimes more, these germs penetrated deeply into the tissues. Then the wound was an infected wound.

In a contaminated wound, it was found that the germs could be removed in a mass by cutting away all the contaminated tissue. Then the wound could be closed at once; and eighty-five to ninety wounds in every hundred would heal at once.

### Great Strides in Healing

In an infected wound this procedure alone was not sufficient. The bacteria were too deep and too numerous. Then Carrel and Dakin came to the rescue. They showed, by experiments, that a weak solution of bleaching powder was the most efficient antiseptic, provided it could be kept continually in contact with the entire surface of the wound. Carrel's little rubber tubes, connected with a reservoir, were laid in the wound in every direction, and every two hours fresh solution irrigated the entire surface of the wound.

The enormous number of lives of our gallant soldiers saved will be shown when the medical and surgical history of the war is published. Never before has such a large percentage of the wounded been saved, nor with such relatively small disability.

THE SURGERY OF PEACE. I need not enter into details here. Every intelligent reader knows that surgical operations have been robbed, not only of pain by anæsthesia but also of their chief danger—infection. An amputation of a breast or an operation for the removal of gallstones or of the appendix early in the attack has practically no mortality, whereas prior to Lister's day amputation of the breast was a very dangerous and therefore rare operation, and removal of gallstones and operations for appendicitis were never done. Most of such sufferers died because the danger practically prohibited any operative interference. Ovariectomy was done. But two out of every three patients died; now scarcely one in a hundred dies.

THE CRY OF THE ANIMALS. I wish I could voice the pleas of the animals, demanding that their happiness, health and lives should also be conserved.

In 1915, when prices were normal, the following were the direct losses in the United States every year, as conservatively estimated in dollars:

Hog Cholera .....	\$75,000,000
Texas Cattle Fever.....	40,000,000
Tuberculosis .....	25,000,000
Contagious Abortion .....	20,000,000
	<hr/>
	\$160,000,000
Other Diseases .....	52,850,000
	<hr/>
Total in 1915.....	\$212,850,000

Not only loss of dollars of value and of urgently needed food but this loss meant sickness, suffering and death to millions of cattle, hogs, horses, sheep, poultry, and so forth. Are not their suffering and death to be weighed in the balance as well as the suffering and death of human beings?

Take only one disease—anthrax, or woolsorter's disease—as an example of what has been done.

Pasteur conquered anthrax. When he began his researches thousands of cattle and sheep were dying from anthrax every year. It was a veritable plague. Moreover, in Europe hundreds and hundreds of human beings were also fellow victims. As Huxley pointed out, the money value of this one victory was enough to pay the whole indemnity paid by France to Germany after the war of 1870!

Read in his Life, by Valery Radot, the dramatic account of his final experiment in 1882 on twenty-five already vaccinated and twenty-five unvaccinated sheep. All of the fifty were inoculated on May thirty-first with the virulent germs of anthrax. He predicted that by June fifth the twenty-five unvaccinated animals would be dead and the twenty-five vaccinated would be living. On June second twenty-three of the unvaccinated sheep were dead, and the other two were dying. Every one of the twenty-five vaccinated sheep had escaped. The animals of all France, nay, of all the world, are his debtors for this victory.

Now, in the name of common sense, was not this a righteous and commendable experiment, and were not the prior experiments which gave such conclusive evidence of the means of escape of millions of hogs, cattle and sheep and thousands of human beings a scientific, a humane and therefore a Christian duty?

What is true of anthrax is true of many other diseases of animals. In addition, there are diseases of animals in which we have not yet found the germ and therefore have no reliable means of vaccination

against them. These, too, must be and will be conquered in time by continued research.

If the A-V's had been in control in France in the seventies and eighties, anthrax and other diseases of animals, now partly or wholly conquered, would still be as rampant as ever.

If only the animals themselves could speak! Would they not, with one accord, cry out: "*Save us from our professed friends, who are in reality our deadly enemies!*"

But a new era seems to be coming. An editorial in the November, 1920, issue of the Open Door, the journal of the New York A-V Society, relates that the San Francisco S. P. C. A. makes the following statement in the San Francisco Bulletin of October 19, 1920:

"Our investigations have shown that the animals receive the same care and consideration accorded to human beings who are subjected to operations of various kinds."

This statement was made as a result of "unannounced visits to vivisection laboratories." If only the other societies would do the same, their views would be greatly changed and they would support such experiments because of the enormous benefits to animals as well as to the human race. The doors are all open.

### The Surgery of Assurance

I have spent sixty arduous years in the study and practice of surgery with the gladdening knowledge that I was aiding my fellow men, women and children to recover from disease and to escape death.

I am not a vivisector, but I know that every day and in every operation upon my fellow creatures since 1876 I have been guided by the results of experimental research. Research has given to surgeons, physicians and obstetricians new operations and new means of treatment wholly impossible of attainment by any other method, and these have been blest of God to millions of our suffering fellow men as well as to animals. These researches have changed the surgery of desperation before 1876 into today's surgery of assurance.

And there is still so much to be learned! So much ignorance to be dispelled! Were there room I could tell of cases in which my own ignorance—an involuntary ignorance shared by all my fellow surgeons—has cost human lives, as afterward I learned to my unending sorrow.

Do you wonder then that my cry—that our cry, as a profession—is for *more light?*

## THE TRUTH ABOUT VIVISECTION

BY ERNEST HAROLD BAYNES

The man of whom John Burroughs said, "He is a sane and accurate naturalist"; the man of whom Theodore Roosevelt said, "He has the highest reputation in all forms of work for the care of animal life"; the man who is known the country over as a lover of animals, has investigated the whole question of vivisection for the COMPANION. The result of his investigation is here published.

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I was led to make a study of vivisection because I discovered that the hearts of many kindly, humane people were being wrung by stories of brutality and torture practiced upon animals in the interest of so-called science.

I made a careful and thorough study of the literature prepared and circulated by the opponents of vivisection, and I was struck with horror at the statements made of wanton, even demoniac cruelty on the part of the physicians, apparently of everyday occurrence in the experimental laboratories of the world. All my life I have been a lover of animals, and my work has been chiefly along the line of caring for our dumb brothers and safeguarding their interests. Naturally, it was of the greatest moment to me to examine into these reports, and to use such influence as I possess in protecting the animals I loved from any such needless and terrible torture as was described in these circulars. If these statements could be proved true, vivisection should be abolished at once and I, as a lover of animals, would be among the first to throw off my coat and work for its abolition.

I am going to take my readers along with me in my investigation and let them decide for themselves the merits of the case.

One of the circulars I examined was a pamphlet of sixty-three pages, recently issued by the New York Anti-Vivisection Society. It is entitled "Medical Opinions Against Vivisection," and claims to voice the sentiment of over 250 medical men "of the highest intelligence and honor." Of course, it is not possible in the space of a magazine article to speak of

every one of these men; but let us take, say, nine fairly representative ones. I will give them all the titles with which the pamphlet credits them.

Elliotson, John, M. D., author "Elliotson's Human Physiology," "Practice of Medicine," Edinburgh, Scotland.

Clay, Charles, M. D., Manchester, England.

Berdoe, Edward, F. R. C. S., L. S. A., L. R. C. P., etc., London, England.

Townsend, Stephen, M. D., F. R. C. S., London, England.

Tait, R. Lawson, LL. D., L. R. C. P., L. R. C. S., F. R. D. C., Former Vivisector, Birmingham, England.

Bell, Sir Charles, F. R. C. S., F. R. S., Prof. Surgery, University of Edinburgh, Scotland.

Treves, Sir Frederick, Bart., M. D., G. C. V. O., C. B., LL. D., F. R. C. S., Sergeant-Surgeon to King George V., etc., etc., London, England.

Editor, "Medical Times and Gazette."

Editor, "Edinburgh Report," Scotland.

### Who Are These Eminent Doctors?

The array of medical opinion, of which the above is a fair sample, certainly looks very formidable. The average reader would naturally exclaim, "Why, there must be something wrong about vivisection, or all those eminent doctors would not be so violently opposed to it." Just as in any court of law the reliability of witnesses must be established before their testimony can be accepted, so I thought I would look into the records of these physicians, and also read exactly what they themselves had to say on the subject of vivisection.

I found that Dr. John Elliotson was not an eminent physician; he was a mesmerist, and founded a mesmerist hospital. He was born one hundred and thirty years ago, and knew nothing whatever of modern methods.

Dr. Charles Clay was born one hundred and twenty years ago, and knew nothing of modern methods. His specialities were geology and archeology.

Dr. Edward Berdoe was born eighty-four years ago. He is the author of "Browning and the Christian Faith," "A Browning Primer," "The Browning Encyclopedia," "The Biographical and Historical Notes of Browning's Complete Works," etc., etc. However eminent Dr. Berdoe may be as a student of Browning, his fame is apparently not based on his achievements in medicine or surgery.

Dr. Stephen Townsend reports himself as a novelist, surgeon, and actor, on the stage for years, playing prominent rôles in "Sowing the Wind," "Slaves of the Ring," "Black Tulip," etc.

Now we come to a really eminent surgeon—Dr. Lawson Tait. Dr. Tait was opposed to vivisection, but later changed his opinion. This recantation the circular did not allude to.

Sir Charles Bell was a very eminent Scotch surgeon, born one hundred and forty-seven years ago. He died nearly eighty years ago. Had he been opposed to the vivisection of his day, when anesthetics were unknown, it would not necessarily mean that he would have been opposed to modern vivisection, which is a totally different thing. It would be like quoting Christopher Columbus in an attempt to prove that modern ocean travel is slow, uncomfortable and dangerous. But, as a matter of fact, Sir Charles Bell's fame is based on vivisection. He is chiefly known for his discovery of the distinct functions of the dorsal and ventral roots of spinal nerves, and for his study of the functions of certain other nerves. His final proofs were secured through experiments on animals, and it is difficult to understand why his name was used as an opponent of vivisection.

### What Doctor Treves Really Said

Sir Frederick Treves is another of the famous men quoted in the circular. This surgeon felt that certain experiments he had performed on the intestines of dogs had done little but unfit him to deal with the intestines of men. Here at last was something definite. I decided to look further into his statements, and I found in the London "Times" of April 18, 1902, the following statement by Sir Frederick Treves:

"Those who are familiar with the controversial methods of the anti-vivisection party, will not be surprised that certain of my remarks have been cunningly isolated from the context, and have been used in advertisements, pamphlets, and speeches, to condemn all vivisection experiments as useless. The fallacy of vivisection can hardly be said to be established by the failure of a solitary series of operations dealing with one small branch of practical surgery. *No one is more keenly aware than I am of the great benefits conferred on suffering humanity by certain researches carried out by means of vivisection.*"

Now we come to the editors of "The Medical Times and Gazette," and "The Edinburgh Report," respectively.

The first of these journals was published in "the dark ages" of medicine, and was dead and buried long before the birth of modern methods. The second I can find no trace of. No such journal is listed in the Index Catalogue of the Library of the Surgeon General's office in Washington. This is the most complete list in the world, and includes every medical journal of the least value.

I went through the entire list in the same way and found to my amazement that most of the testimony was of the same unconvincing character. Space does not permit my going into the list in greater detail in this article.

But let us go just a little further before we leave "Medical Opinions against Vivisection." On page 2 we are informed that only twenty-five per cent. of the medical fraternity favor vivisection. If that could be proved true it would be a significant fact. I determined to look into this statement.

The only way we have of determining the attitude of medical men as a body is through their recorded actions at their great meetings, where sometimes several thousands of individuals are represented. I found that the British Medical Association and the American Medical Association, as well as the American Association for the Advancement of Science, had passed, unanimously, strong resolutions in favor of vivisection. I happen to have before me a copy of a resolution unanimously approved by the International Medical Congress which met in London in 1913. This congress was composed of distinguished physicians and surgeons from all over the world. The first sentence runs as follows:

Resolved: That this congress records its conviction that experiments on living animals have proved of the utmost service to medicine in the past, and are indispensable to its future progress.

I have never seen nor heard of a resolution passed against vivisection by a recognized medical society or any other scientific body.

What could the pamphlet mean by stating that only twenty-five per cent. of the medical fraternity were in favor of vivisection?

The opponents of vivisection base their whole campaign on two propositions:

1. That animals are ruthlessly tortured in the laboratories to gratify

the curiosity of heartless doctors who gloat over the agony of their helpless victims. (This is not an exaggerated statement of their case.)

2. That no benefit to mankind or to animals has ever been derived from vivisection.

Again, if these propositions are true—if they are even approximately true—you and I, and all the decent people we know, should join hands in driving vivisection from every state in the Union.

\* Let us see if they are true. Let me take them up one at a time.

Before 1846, practically all surgery, whether on human beings or animals, was painful, because no effective anæsthetic was known. Vivisection was done in those days, and of course the animals suffered. But even then the surgeons were not trying to torture animals, they were seeking newer and safer ways of performing operations—more light on the functions of the various organs of the body, with a view to advancing medical science for the benefit of man. And that they did so advance their science is a matter of history. To mention only one advance they made, Harvey, according to his own testimony, discovered the circulation of the blood through vivisection.

### An Occasional Heartless Doctor

Now there have been a very few surgeons, before and since the discovery of anæsthetics, who have not had proper consideration for the animals they used in their experiments. Just as we occasionally find a reckless chauffeur who drives his car at high speed through a crowded thoroughfare, so occasionally we find a heartless doctor who seems indifferent to the pain he inflicts on animals. One such man was Mantegazza, an Italian surgeon, whose book "The Physiology of Pain" was published forty years ago. Another was Dr. B. A. Watson, of Jersey City, who performed some very cruel experiments in studying the effect of "shock." Both of these men have long been dead. No one attempts to defend the cruelties they were guilty of; they have been severely censured by the medical fraternity.

The other vivisectionists whom the anti-vivisectionists often refer to are Magendie, Brachet, and Claude Bernard. Magendie died in 1856, Brachet in 1858, and Claude Bernard in 1878; but I found that the literature usually mentioned them as if they were still living, and as if such painful operations as they sometimes performed from fifty to a hundred years ago in France were of daily occurrence in American laboratories of the



present day. This is not only untrue but it struck me as very unfair, and an insult to the humane people to whom the appeal is being made.

Now I began to look into the character of the doctors who are engaged in animal experimentation. With a sincere wish to learn the absolute truth, I visited many laboratories both in this country and abroad, some of them, like the Rockefeller Institute, several times. I have seen many operations on animals—five within the past month—and although I usually visit these places unheralded, I have never seen anything in the nature of cruelty to animals. I do not say that there is no suffering in research laboratories, because there is. Perhaps two or three per cent. of the animals used suffer more or less actual pain; many more suffer some discomfort, but it is so little compared with the pain and discomfort from which human beings and animals are saved by these experiments that it becomes insignificant.

Instead of the "brutality and heartlessness" I have read about, I found nothing but kindness and consideration. A few days ago I was in a laboratory of a great cancer hospital in Buffalo, New York. On the door of the operating-room was posted a set of rules which I would like to give in full. As space will not permit this I will quote from two or three.

I. Vagrant dogs and cats brought to this laboratory and purchased here shall be held at least as long as at the city pound, and shall be returned to their owners if claimed and identified.

II. Animals in the laboratory shall receive every consideration for their bodily comfort; they shall be kindly treated, properly fed, and their surroundings kept in the best possible sanitary condition.

IV. In any operation likely to cause greater discomfort than that attending anesthetization, the animal shall first be rendered incapable of perceiving pain and shall be maintained in that condition until the operation is ended. Exceptions to this rule will be made by the director alone, and then only when anesthesia would defeat the object of the experiment.

These rules, imposed by the doctors themselves, are posted in practically every laboratory in the country, and are conscientiously lived up to.

At Johns Hopkins University, where I went last week, and where many dogs are kept for experimental purposes, there is a sign in the Hunterian Laboratory, which reads, "Any attendant who strikes a dog is to be discharged at once."

Even were the surgeons as heartless as we have been led to believe—

a preposterous thought—they would still give the animals every care, for the selfish reason that their own success depends on it. If you have ever tried to hold even a small dog or cat which has made up its mind to get away from you, you will realize how absurd it would be to try to perform a delicate surgical operation on that animal, no matter how securely he might be tied, unless he were first rendered insensible by anesthesia. For the same reason, even a heartless doctor would see to it that an animal was well taken care of both before and after the operation, because neglect would militate against the success of the experiment.

### The "Pavlov" Dog

In another recent pamphlet put out by the anti-vivisectionists much is said about the Pavlov experiments, so called because a famous Russian physiologist of that name first performed them, with a view to obtaining pure gastric juice; that is, gastric juice unmixed with the food taken into the stomach. In the pamphlet the feelings of the reader are harrowed by a revolting description of the sad plight of dogs doomed to supply this gastric juice.

Now, speaking very briefly, the chief operation involved consists of dividing the stomach into two parts, a large part and a small part, separated from each other by a double layer of mucous membrane. In the large part digestion goes on just as it did before the operation. The small part, known as a Pavlov pouch, has a little hole in one end, and the edge of this is attached to the edge of a small opening of the same size in the abdomen. The wound quickly heals, and there is no more discomfort than one has from a natural opening—the mouth or nostrils, for example. The Pavlov pouch being separated from the rest of the stomach, no food can enter it. But, interestingly enough, when the dog eats his food—just as other dogs do by the way—gastric juice is secreted, not only in the stomach itself, but in the little pouch which was once a part of the stomach. From this it is allowed to trickle into a cup or jar, and pure gastric juice is obtained.

A few weeks ago I was in the Physiological Laboratory of Chicago University, and I was looking for the room of a professor with whom I had an appointment. Presently my attention was attracted to a door by the sounds of scuffling feet, the laughter of several men and above all the joyous barking of a dog. I opened the door and there were several doctors, playing with a little yellow dog with a broad white bandage

around her middle in the form of a belt. They were romping with her and she was thoroughly enjoying herself. The doctors later introduced her to me as "Buster—a member of the staff." This is a "Pavlov" dog, and, as I wrote to Mrs. Baynes, "it is one of the happiest, best-cared-for little dogs I have ever seen." The original operation was performed under ether eight years ago.

### Is Anything Accomplished by Vivisection?

Now for the second contention made by the opponents of vivisection—namely, that no benefit to mankind or to animals has ever been derived from vivisection.

Here again, if this contention were based on the facts, you and I would jump straight to our feet and vote against vivisection. Let us look the facts fairly in the face.

Many years ago I had a little brother, not quite three years old, who came down with diphtheria. A doctor was called, and he did all that a doctor of those days could do. But he was almost as helpless as my mother, who watched the child die in all the agony of strangulation. And this was a very common experience in those days. In literally thousands of cases, weeping and often frantic mothers stood by the bedsides, begging, pleading, for little lives, while the surgeons stood by with jaw set and scalpel in hand, ready to take the last dread measure and open the trachea (windpipe) to prevent actual strangulation.

To-day, such scenes, in diphtheria cases at least, are practically unheard of. As soon as it is known that a child has diphtheria it is given an injection of diphtheria antitoxin, and if this is given on the first day the child recovers as a matter of course. In cases where the injection is not given until the second day, the death rate is between four and five per cent.; if delayed until the third day, the death rate is about twelve and a half per cent.; if postponed until the fourth day sixteen and a half per cent. These figures are given by the Hospital for Contagious Diseases, New York City, and represent observations on 2,849 diphtheria patients.

Every up-to-date hospital for the treatment of diphtheria, all over the world, and practically every physician of standing, uses diphtheria antitoxin. The decline in the death rate of diphtheria patients dates from 1895—the year in which this antitoxin was introduced. Tracheotomy (cutting of the windpipe) became a rarer and rarer operation, and today, as far as diphtheria is concerned, is unnecessary.

By a series of most careful and painstaking experiments on mice, guinea pigs, rabbits and a few monkeys, Loeffler discovered this blessed antitoxin which, it has been estimated, saves the lives of a hundred thousand human beings every year. And it will go on saving them in the years to come, at least until some better cure is discovered. I do not know of any finer use to which a couple of hundred guinea pigs and rabbits could be put. Even if it were life for life, would you not vote to sacrifice a guinea pig or a rabbit to save the life of a child?

### The Fatal Childbed Fever

Another terrible scourge, which the more elderly of my readers will have heard of, was puerperal or "childbed" fever. It used to cause the death of from three to five out of every hundred mothers. During epidemics it killed twenty, forty and sometimes even as high as fifty-five out of every hundred. In some cases the mortality was so frightful that a maternity hospital would be closed, because half of the women entering it were practically doomed to die of childbed fever.

Then, Pasteur, the great bacteriologist—the great vivisector, if you will—came along and by animal experimentation discovered the microbe which caused the fever. His work was followed up by the great surgeon and vivisector, Lord Lister, and the experiments of these two laid the foundation of modern surgery. Their experiments proved that infection of wounds was caused by germs. Aseptic methods began to be used—that is, every effort was made to keep wounds free from harmful germs.

Antiseptic hand-scrubbing, sterilized instruments and uniforms, and scores of other precautions were taken by doctors and nurses and, behold, the deadly puerperal fever is practically wiped off the list in the maternity hospitals. I have recently noted one series of over eight thousand births without the loss of a single mother from this cause. In the days before Pasteur and Lister there would certainly have been two hundred and fifty deaths in that series.

If you could see those two hundred and fifty mothers lined up with their babies in their arms, would you condemn them to painful death, and all their relatives to grief, in order to save from less painful death an equal number of guinea pigs, rabbits, and billy-goats—or even dogs, much as we love them? Of course you wouldn't—nor would anyone who has imagination enough to enable her to think straight, and to see things in their proper proportions. But that saving of life was in a series of

8,000 mothers. This isn't a question of eight thousand or eight million mothers. The discoveries of Pasteur and Lister, and those of their brave and distinguished followers, affect the mothers of every civilized country in the world, and not this year and next year, but every year as long as the human race exists.

### Deaths from Typhoid

In the Spanish-American War, of which I am a veteran, nearly seventeen per cent. of the soldiers—that is, one in every six—had typhoid fever. It was the cause of six times as many deaths as all other causes put together. I speak with feeling, for I was one of those who had it. In the World War there was practically no typhoid fever, for the very simple reason that a vivisector named Wright had discovered a vaccine which prevented the soldiers from contracting it. It was used by the armies of all the civilized countries engaged, and practically every soldier was treated with it. It is estimated by Colonel William H. Arthur, late commandant of the Army Medical School, and now medical director of the Georgetown University Hospital, that this vaccine saved the lives of at least thirty thousand boys in the American army alone, and that it saved at least two hundred and sixty thousand more from three or four months of illness and incapacity. And this is in the American army alone.

Of such vast importance to the world are the results of such experiments as are being carried on by vivisectors that in cases in which, for some reason, animals do not afford a suitable medium for their work, they sometimes offer themselves as subjects. An instance is that of the American Commission appointed in 1900 to make an investigation of the deadly yellow fever in Cuba. It had existed perpetually in Havana, and occasionally it invaded this country, especially the Southern states, where in one epidemic it destroyed 16,000 persons. It constituted one of the principal reasons for the French abandoning the Panama Canal project. It had taken a toll of 22,189 workmen, and no life in that pestilential zone was safe from it.

### How Yellow Fever Was Wiped Out

When the American Commission, headed by Major Walter Reed and Dr. James Carroll, was appointed by Surgeon-General Sternberg, no one had any clear proof either as to the cause of the disease or the means by

which it was spread. As animals are not subject to yellow fever, it was necessary for men to volunteer. Dr. R. P. Cook and several private soldiers of the American army slept for twenty consecutive nights on the mattresses on which yellow fever patients had died, clad in the pajamas and covered with the terribly soiled bed clothing in which those patients had spent their last days. This and other experiments too awful to describe they subjected themselves to; but as they remained perfectly well, they proved that yellow fever is not contagious. Then Doctor Reed believed that the disease was spread by mosquitoes; so he and Doctor Carroll and several others allowed themselves to be bitten by mosquitoes which had previously bitten yellow-fever patients. Very soon most of the volunteers were down with yellow fever, and some of them never got up again. One of these was Doctor J. W. Lazear, a member of the commission who, after several days of delirium, died in convulsions. But they proved Reed's theory to be correct, and then the army, by wiping out the mosquitoes, rid Havana of yellow fever forever. Later, General Gorgas in the same way cleaned up the Panama Canal Zone.

The above are only a few of the many advances in medicine made through animal experimentation.

The achievements in surgery have been even more striking. Before the days of Lister, abdominal operations were rarely done, and when done were usually fatal. Now they are performed daily in thousands of hospitals, and thousands of people are saved who in the old days would have died of "inflammation of the bowels" (appendicitis), and other diseases for which surgeons dared not operate. In the Civil War if a man was shot through the bowels, he died. In the World War thousands of cases of this kind made complete recovery. Why? Because the surgeons knew just what to do—how to sew up the holes—how to join the ends of the severed tubes so that they would not leak, and so that they would heal perfectly. The skill required to do this was gained through vivisection. It is safe to say that for every animal used in those experiments, a hundred human lives were saved in the World War alone.

Compound fractures used to kill two out of every three patients—over sixty-six per cent.; today the mortality from this cause is well below one per cent. This saving of life was brought about by animal experimentation.

The same may be said of surgery of the chest, surgery of the head, indeed, surgery of every kind.

The whole question is one of proportion. All history will bear me out

when I say that no bodily sacrifice, whether of animals or of men, is too great to be made, provided the cause for that sacrifice is proportionately great.

### Was Doctor Grenfell Justified?

It has always been an axiom that a man's life is of greater consequence than an animal's life.

When Doctor Grenfell was afloat on an ice pan, and killed three of his faithful dogs that he might get their skins to keep himself from freezing, the world applauded him for the brave, resourceful man he is. It was considered better that they should suffer and die than that he should suffer and die.

He was not hardened by causing that suffering; he was touched with gratitude. He had a tablet erected to the memory of those splendid dogs, and the names of Moody, Watch, and Spy will go down in history with that of Grenfell himself and the other heroes of the Labrador.

Yet I know that Doctor Grenfell will not misunderstand me when I say that the killing of those dogs was selfishness personified when compared with the work of the vivisectors. He killed three dogs, his personal friends, to save one life—his own. The vivisectors take no such toll as that. For every animal they cause to suffer and die, they save unnumbered human beings from suffering and death. As I have said, the question is one of proportion. The greater the cause, the greater the sacrifice which it justifies.

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In this article I have sought to give facts, and allow my readers to make their own deductions. I honestly believe that some of the people who are preparing literature against vivisection are either making statements which they know to be untrue or misleading, or are deliberately closing their minds to the truth in its larger aspect.

The Editor of this magazine, believing as I do that all of you are entitled to the truth and that you will welcome it, has given me the opportunity to put it before you, stipulating that I shall make no statement without ample evidence to support it. I should not present this case, nor would the *Woman's Home Companion* publish it, if we did not both believe that it is of the utmost importance to the human race, and to animals as well, that medicine and surgery be allowed to advance, unhampered by ignorance, prejudice, and sentimentality.

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